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## A New Anoline Lizard (*Phenacosaurus*) from the Highland of Cerro de la Neblina, Southern Venezuela

CHARLES W. MYERS,<sup>1</sup> ERNEST E. WILLIAMS,<sup>2</sup>  
AND ROY W. McDIARMID<sup>3</sup>

### ABSTRACT

*Phenacosaurus neblininus*, new species, was discovered during the 1984–1985 expedition to Cerro de la Neblina on the Venezuelan-Brazilian border. It was found at several highland camps (> 1600 m) but seems unaccountably rare, with only six specimens collected. The closest relative of this

lizard may be another new species (Williams et al., ms) known from a single specimen from Chimantá Tepui—some 600 km to the northeast of Neblina. Except for these two Venezuelan tepui species, *Phenacosaurus* has a strictly Andean distribution, from northwestern Venezuela to Peru.

### RESUMEN

*Phenacosaurus neblininus*, especie nueva, fue descubierta durante la Expedición (1984–1985) al Cerro de la Neblina en la frontera entre Venezuela y Brasil. Fue encontrado en varios campamentos altos (> 1600 m.s.n.m.) pero parece que es inexplicablemente raro, con solamente seis especímenes colectados. El pariente más cercano de este lagarto

es posiblemente otra especie nueva (Williams et al., ms) conocida de un espécimen de Chimantá Tepui—más de 600 km hacia al nordeste del Cerro de la Neblina. Salvo por estas dos especies de los tepuis venezolanos, *Phenacosaurus* tiene una distribución geográfica estricta a los Andes, desde Venezuela noroeste hasta a Perú.

<sup>1</sup> Chairman and Curator, Department of Herpetology and Ichthyology, American Museum of Natural History.

<sup>2</sup> Curator Emeritus, Museum of Comparative Zoology, Harvard University.

<sup>3</sup> Project Leader and Curator, Biological Survey, U.S. Fish and Wildlife Service, National Museum of Natural History, Smithsonian Institution.

## INTRODUCTION

Cerro de la Neblina—Mountain of the Mist—is an enormous equatorial table mountain rising precipitously from lowland rain forest and swamp forest in the borderland between southern Venezuela and northwestern Brazil (Maguire, 1955; Brewer-Carías, 1988). The highest peak on this massif is Pico da Neblina at an elevation of 3014 m, making it the highest mountain in South America outside the Andean cordilleras. Pico da Neblina lies in Brazil near the international border with Venezuela (the border extends across the southern escarpment of Cerro de la Neblina and then along its eastern side). Most of Cerro de la Neblina is in Venezuela at an average elevation of approximately 2000 m above sea level. On the northwestern side, the massif consists of an extensive mesa (fig. 1); the remainder, however, is highly dissected (figs. 8, 9) and parted nearly in half by the Cañon Grande, one of the world's deepest canyons.

Cerro de la Neblina usually is ringed with clouds all around the escarpment; this white halo is obvious on most satellite images. In any season, the massif is subject to violent storms that result in torrential floods in the lowlands east of the Cañon Grande. During the drier months, the vast central reaches of the massif receive direct sunlight on many days and are accessible by helicopter.

The Neblina Expedition consisted of a series of discrete and intensive surveys of the Cerro in 1984 and early 1985. Three groups of herpetologists worked in highland camps on Neblina: Charles J. Cole, Roy W. McDiarmid, and Richard G. Zweifel collected February to March, 1984; Linda S. Ford and Charles W. Myers collected from late November to early December, 1984; and Rex Cocroft, R. W. McDiarmid, and Alfredo Paolillo O. worked on the final trip January to March, 1985. These three groups also collected extensively at the lowland base camp. Helicopter support was unavailable to a fourth group that included herpetologists (L. S. Ford, C. W. Myers, A. Paolillo O., Janis A. Roze); this party traveled by dugout from the Rio Negro and the Canal Casiquiare, as far as the mouth of the Cañon Grande at the western

base of Neblina, and worked only in the lowlands, during June, 1984.

The extensive lowland swamp forest and rain forest around the base of Cerro de la Neblina support a rich herpetofauna with strong Amazonian affinities (McDiarmid and Paolillo O., 1988; Zweifel, 1986). In contrast, the depauperate highland herpetofauna includes a high percentage of endemics whose biogeographic and phylogenetic relationships are less clear, although some may belong to a "Pantepui" biota (Mayr and Phelps, 1967).

The purpose of the present paper is to describe one of four new lizards taken in the Neblina uplands (see also Donnelly et al., 1992). In coloration and habitus, the present species superficially resembles *Anolis jacare* Boulenger from the Venezuelan Andes. But the new lizard has a small middorsal scale crest and a few osteological features that are not inconsistent with the genus *Phenacosaurus*, to which we tentatively assign it. Most postcranial osteological characters (except shape of ilium) do not support this placement but neither do they repudiate it. The expansion of *Phenacosaurus* is being dealt with elsewhere (Williams, in progress).

***Phenacosaurus neblininus*,**  
new species

Figures 2–5, 7A

**HOLOTYPE:** AMNH R-129241 (field no. CWM 18308), a female obtained by C. W. Myers and L. S. Ford, November 29–30, 1984, at Camp 7, 1850 m, Cerro de la Neblina, Amazonas, Venezuela (0°50'40"N, 65°58'10"W).

**PARATYPES:** Five specimens, all from the Cerro de la Neblina massif as follows: MBUCV (CWM 18309), a female with same data as holotype; MBUCV (RWM 17197), Camp 2, 2085–2100 m (0°50'00–12"N, 65°58'48"W), a juvenile collected by R. W. McDiarmid and Tim McCabe on February 18, 1984, and USNM 322911, a male collected by Alfredo Paolillo O. on Jan. 29, 1985; AMNH R-136763, Camp 3, 1820 m (0°54'10"N, 66°03'50"W), a male collected by C. J. Cole on Feb. 17, 1984; USNM 322912,

Camp 10, 1690 m (0°54'40"N, 66°02'30"W), a female collected by R. W. McDiarmid and Warren E. Steiner on February 12, 1985.

**ETYMOLOGY:** The species name and the name of the great isolated mountain on which it lives are based on the Spanish *neblina* (mist). For the lizard we add the adjectival-forming Latin suffix *-inus* (belonging to).

**DIAGNOSIS:** In having homogeneous flank scales, *P. neblininus* differs from members of the *heterodermus* species group of *Phenacosaurus* (scales highly heterogeneous) but resembles members of the *orcesi* group. Within the latter, *P. neblininus* most closely resembles an undescribed species of *Phenacosaurus* from Chimantá Tepui (Williams et al., MS), from which *neblininus* differs in having a much smaller ear (smaller, not larger, than interparietal) and in having a pale, weakly spotted belly (not boldly reticulated with dark).

*Phenacosaurus neblininus* superficially resembles Venezuelan *Anolis jacare* and *Anolis nigropunctatus* in pattern and habitus, but is distinguished by the presence of a U-shaped circumparietal crest, and a dorsal scale crest and a more or less dentate caudal crest. It differs from Peruvian *Anolis proboscis*, which has both dorsal and caudal scale crests, in the variable expression of the dorsal crest within and among individuals, in the circumparietal crest, a shorter tail, and absence of a proboscis.

## DESCRIPTION

**SIZE AND MEASUREMENTS:** The type series consists of six specimens, including an unsexed juvenile 38.7 mm snout-to-vent (SVL), three adult females 56–57 mm SVL, and two adult males, 56–64 mm SVL. The two males are judged mature because of their large dewlaps; one of the 56 mm females (USNM 322912) is sexually mature as shown by the presence of a large (4 mm) ovum in the left ovary.

Three or four measurements (in mm) are given for each specimen in the following sequence: SVL + tail length (if tail is complete); HL (head length from tip of snout to end of mandible), HW (greatest head width). *Juve-*

*nile*: MBUCV-RWM 17197 (39.1, 12.3, 7.0). *Females*: AMNH 129241 (56.1, 17.3, 8.8), MBUCV-CWM 18309 (56.9, 17.4, 9.0), USNM 322912 (56.0 + 84, 16.9, 8.6). *Males*: AMNH 136763, (56.4 + 86, 18.0, 9.3), USNM 322911 (63.5, 20.1, 10.0).

## HEAD

*Phenacosaurus neblininus* has but a weak casque, which is formed by low supraorbital and circumparietal outgrowths. These seem undeveloped in juveniles and indistinct in the smallest adult female. There are also postocular outgrowths with an underlying bony structure on the side of the head. See below and under Osteology for further discussion.

Visual comparison of all specimens at one time suggested that males may have relatively larger heads than females. This impression was reinforced by inspection of plots of head measurements (see above) against length of trunk (trunk = SVL – HL) and also is suggested by the ratio of head length/trunk length: HL/Trunk = 0.432–0.446 ( $\bar{x}$  = 0.4397) in three adult females and 0.463–0.469 in two adult males. Possible dimorphism in greatest head width relative to trunk length is less evident: HW/Trunk = 0.220–0.230 ( $\bar{x}$  = 0.2260)♀, 0.230–0.242♂.

The unsexed juvenile has a relatively wider head than all adults (HW/Trunk = 0.261), but it is intermediate in head length (HL/Trunk = 0.459), albeit closer to the adult males.

## Dorsal Head Scales and Crests

**ANTORBITAL AREA:** Scales moderate to small, smooth or lightly rugose, sometimes with few small pustulations. Four to seven postrostrals, including circumnasals or not. Circumnasal slightly encroached on or not by a postrostral (which therefore is also an anterior nasal), or by supranasal. Circumnasal either in contact with the rostral-first supralabial sulcus or separated from rostral by a postrostral that is in contact with this sulcus. Three to six scales between the circumnasals dorsally. Supranasals present or not. Frontal depression moderately deep, a central scale largest or not, nearly all scales in depression



Fig. 1. Northwestern edge of the Cerro de la Neblina massif. Orographic cooling of moist air rising from the base of the mountain—more than a mile below—results in nearly constant cloud formation along the edge of the escarpment. A rock outcrop shows right of center in foreground; a cluster of expedition tents shows as a pale spot further to the right, on the mesa beyond. [Photographed February 1984, by Ian Stupakof, American Museum of Natural History]

larger or much larger than those at tip of snout.

Five to six canthals on each side, the third largest, one or two smaller scales between anteriormost canthal and circumnasal. Small variable-size scales lying medial to anterior canthals and lateral to larger scales, the latter lying in vague double or triple rows between postrostrals and frontal depression. Four to six scales across snout between the second canthals.

**ORBITAL AREA:** Lateral margin of supra-orbital semicircles overlying a bony supra-orbital crest that is anteriorly confluent with hard, sharp canthus rostralis and posteriorly confluent with circumparietal and postorbital crests (see following). Scales of supraorbital semicircles large, smooth or lightly rugose, two to three pairs in contact medially. Scales of supraocular area smooth or very weakly rugose. On each side two to four large supra-

oculars in one row, with two in contact with semicircles or all separated by subgranular scales. Lateral to large supraoculars are markedly smaller scales, which become granular at superciliary border. First superciliary markedly elongate and posteriorly tapering (occasionally followed by one or two very small elongate scales), with superciliary border posteriorly continued by granules not distinguishable from adjacent granules of supraocular region.

**PARIETAL AREA:** Circumparietal crest externally comprising lateral ridges curving gradually medially and connecting posteriorly across occiput; posterior part of this crest usually broadly transverse, lacking median notch. Circumparietal ridge not visible in juvenile of 39 mm SVL, indistinct in one adult female, strongest in adult males. Scales on circumparietal crest lacking distinct pustulations or rugosities, usually not greatly larger

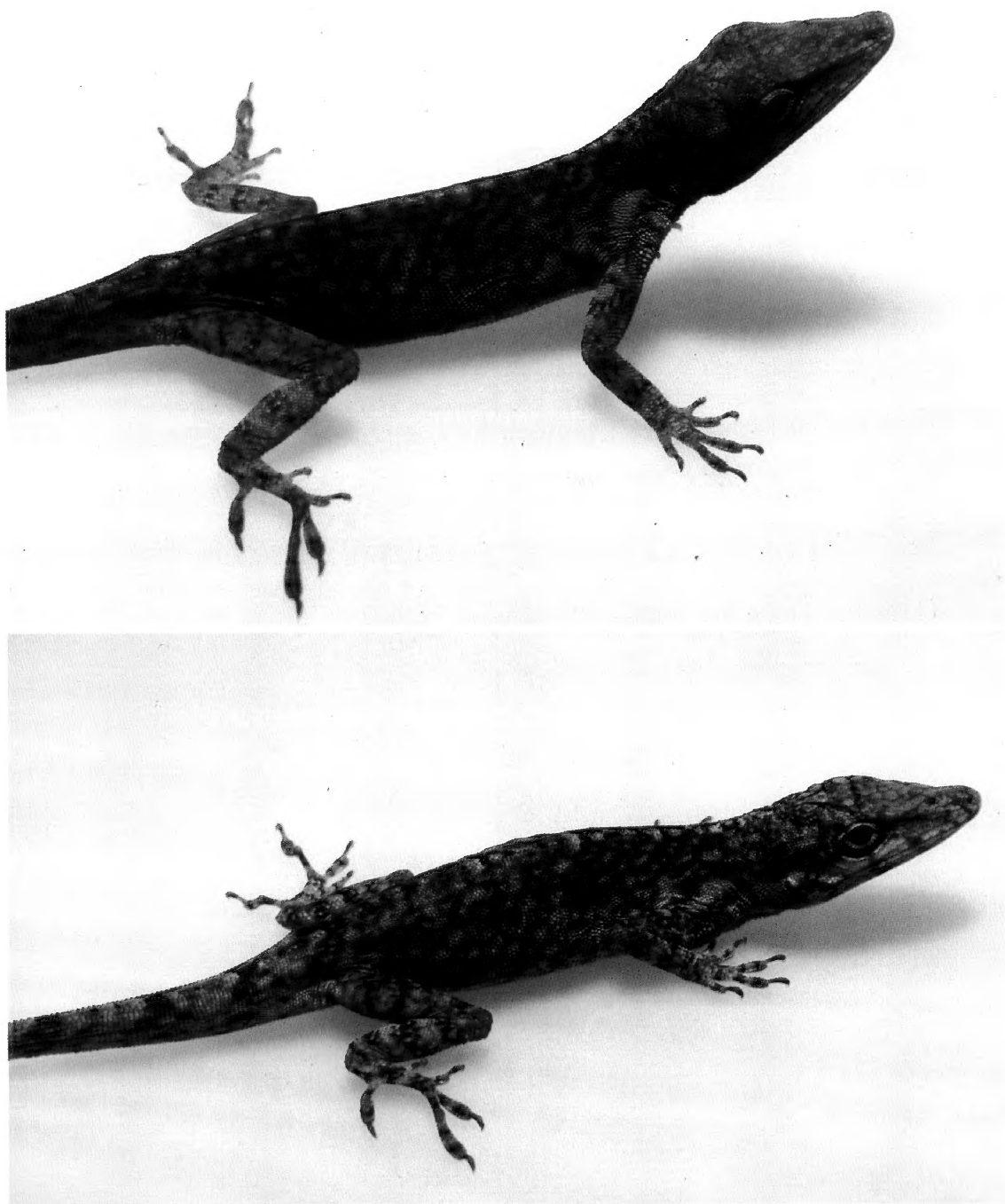


Fig. 2. *Phenacosaurus neblininus*, new species. Two views of the female holotype (AMNH 129241) in life, approximately  $\times 1.7$ – $1.9$ . These photographs, taken seconds apart ( $< 1$  min), show virtually the entire range of ground colors, from light brown (top) to light gray (bottom, change to gray nearly completed).

than adjacent supratemporal or nape scales. The interparietal and scales lateral to it distinctly larger than other scales in parietal area, subequal to or somewhat smaller than large

scales in frontal depression, but weakly to strongly rugose or pustulate, sometimes with obscure borders. Small parietal eye usually visible (not detected in largest adult male,

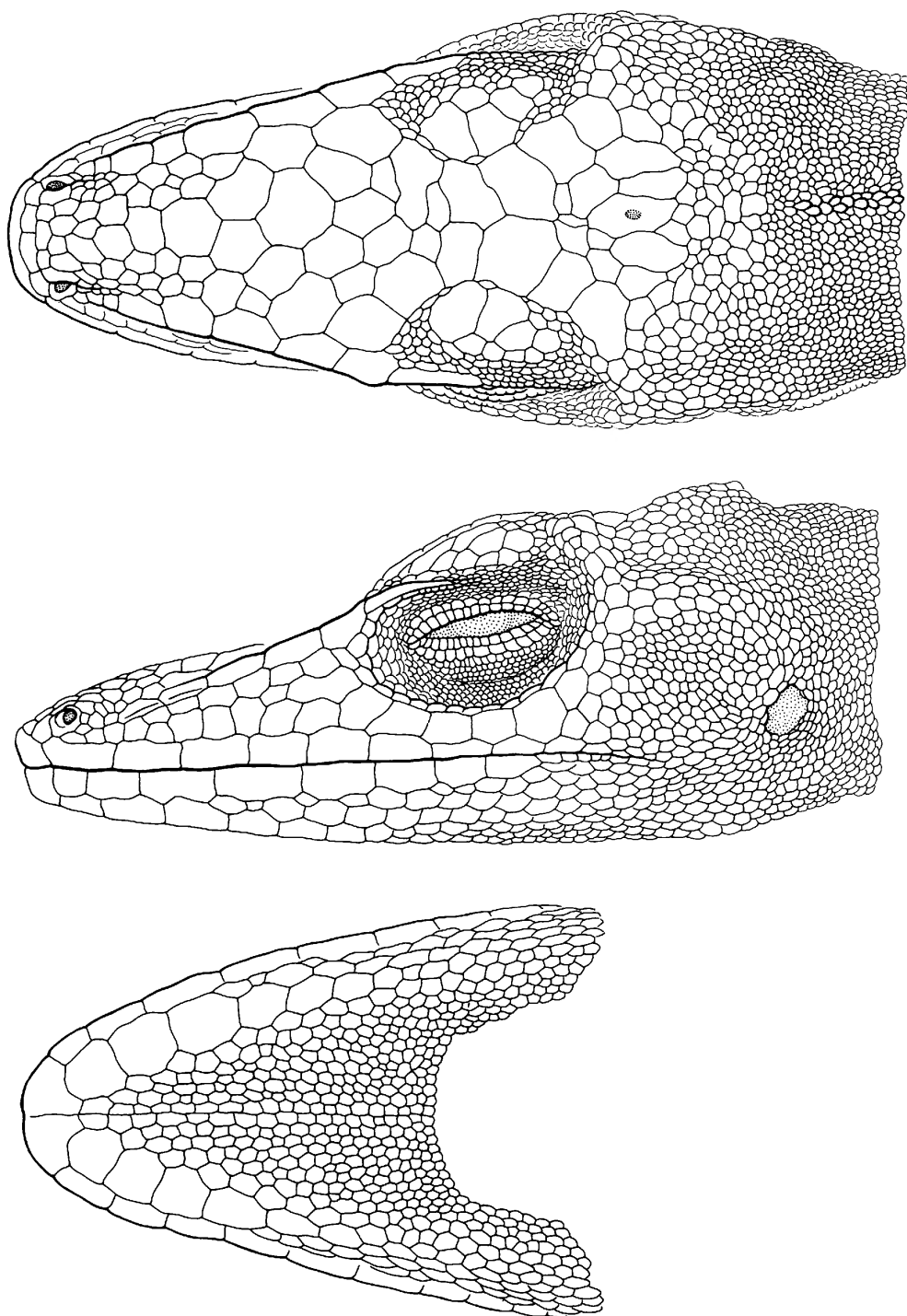


Fig. 3. *Phenacosaurus neblininus*, new species. Dorsal, lateral, and ventral views of head of holotype (AMNH 129241),  $\times 6$ .

USNM 322911). Interparietal longer than wide, oval or pointed anteriorly and posteriorly, distinctly larger than ear; interparietal may be in contact with a semicircle but usu-

ally separated by 1–2 scales. About four to six scales, variable in size, between interparietal and posterior (transverse) part of circumparietal crest.

### *Lateral Head Scales and Crests*

Maximum of three loreal rows, with total of 11–17 loreals per side. Preoculars 2–3, uppermost in contact with second canthal. Suboculars 4–5. Postoculars not well defined, grading into lower temporals. Supralabials 7–8 to below center of eye.

A vertically aligned, parenthesis-shaped crest behind eye, followed by short, weakly differentiated, horizontal temporal crest. Postocular crests essentially contiguous, forming a  $\text{J}$ - or  $\text{C}$ -shaped crest (left/right) on side of head; postocular crest dorsally approaching or contiguous with circumparietal-supraocular crest.

Lower temporals small, flat or slightly convex, smooth, juxtaposed. Horizontal temporal crest covered by two rows of slightly enlarged scales, largest next to postoculars thence grading posteriad to scales not distinguishable from nape scales. Upper temporals immediately above temporal crest small, flat, smooth, subequal, becoming somewhat larger adjacent to circumparietal crest.

Ear opening obliquely ovoid, varying in size but never larger than the interparietal, almost surrounded by subgranular scales but one or two scales at upper anterior margin noticeably larger.

### *Ventral Head Scales*

Mental almost completely divided, very bluntly indented medioposteriorly, in contact with 4–6 postmentals between infralabials, including very well-developed first sublabials on each side that are much larger ( $\geq 6$ –7 times) than medial (postmental) gulars. An additional 2–4 sublabials on each side in contact with infralabials. Central gulars small, smooth, slightly swollen, becoming somewhat larger and more or less polygonal toward the sublabials.

### TRUNK

A low middorsal crest, starting close behind circumparietal crest and continuing onto tail; middorsal crest sexually dimorphic but highest and most evident on nape in both sexes. In females, this median crest is very low and broken; female crest scales never much larger than paravertebrals and usually triangular only on nape. In both males, the

median dorsal crest is higher and present along most of length of dorsum; anterior triangular crest scales in males as much as twice the size of paravertebrals, but posterior crest scales lower and smaller.

Paravertebral and flank scales subequal, flat or slightly swollen, tending to form transverse rows, or, on lower flanks, some partly separated by granules or naked skin.

Ventrals smooth, larger than any dorsals, subquadrate, in transverse rows; imbricate, subimbricate or partly separated by naked skin.

### LIMBS

No pocket in axilla. Upper arm scales rugose or weakly keeled; slightly separated dorsally; juxtaposed or subimbricate anteriorly; smaller, smooth, and subimbricate posteriorly; equally small and smooth ventrally but slightly separated. Lower arm scales dorsally smooth, or weakly keeled and imbricate, becoming larger and more distinctly keeled distally; large, keeled and imbricate anteriorly; smooth and juxtaposed, or subimbricate posteriorly and ventrally.

Thigh scales anteriorly large, keeled or rugose, imbricate; dorsally and posteriorly granular, slightly separated; ventrally smooth, separated. Some tibial scales imbricate and keeled anteriorly and posteriorly; dorsally smaller, smooth or weakly keeled, juxtaposed; posteriorly and ventrally smooth and imbricate.

Distal phalanx narrower than, and inserting above, the greatly dilated pads of the second and third phalanges. Supradigitals smooth to uncarinate. Lamellae under phalanges ii and iii of fourth toe 17 to 23.

### TAIL

Nonprehensile tail is 1.5 times longer than SVL in one adult male and one adult female (only specimens with complete tails). Tail laterally compressed. Median body crest continuing onto tail weakly and inconspicuously in females, but higher and distinctly dentate in males (continuing nearly to tip in one male with complete tail). Lateral caudal scales not keeled near base of tail, small, quadrate, weakly rugose, becoming larger and distinctly keeled posteriorly. Scales behind vent smooth,

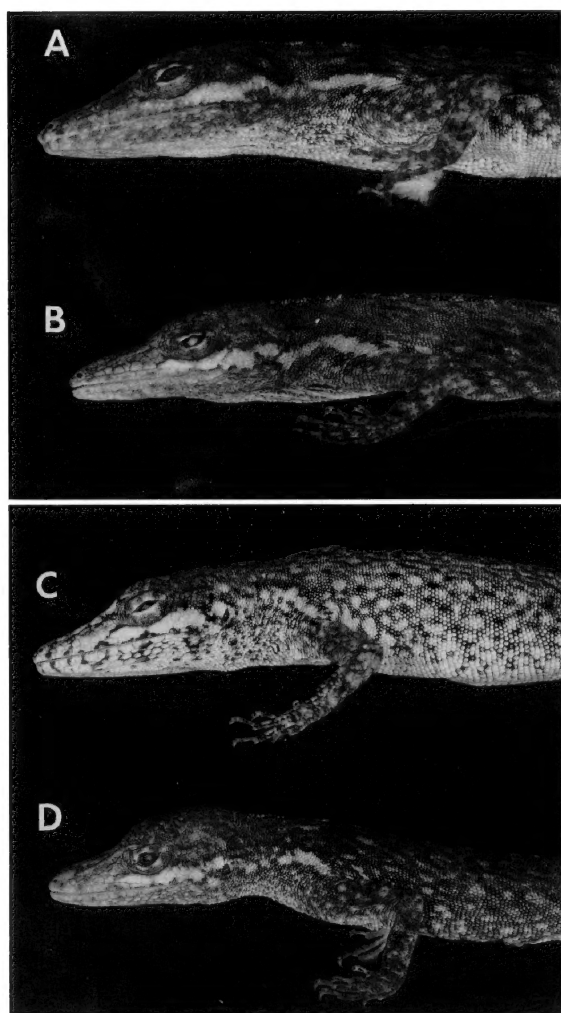


Fig. 4. *Phenacosaurus neblininus*, new species. Lateral view of heads and anterior bodies of two adult male (A, B) and two adult female (C, D) paratypes. A, USNM 322911; B, AMNH 136763; C, MBUCV (CWM 18309); D, USNM 322912. All  $\times 1.5$ .

becoming keeled well posteriorly. Strongly enlarged postanals in males; postanals unenlarged in females and juvenile.

#### DEWLAP

In males reaching onto first third of belly; in females extending only to just behind insertion of limbs. Edge scales in males larger than ventrals, in females much smaller. Lateral scales in males larger than ventrals, in females abruptly larger than edge scales, but still smaller than ventrals.

#### COLORATION

**COLOR IN LIFE:** To a limited extent, color is changeable within individuals—the ground color basically varying between light brown and light gray, with ill-defined blackish brown markings (fig. 2). The head is relatively unmarked, followed by a series of irregular, small blackish middorsal markings along the back and a vague blackish reticulum on the sides; the paler ground color shows as alternating areas of lighter brown, tan, or gray along the middorsum and as more or less diagonal rows of pale spots in the lateral reticulum. A weak to strong dark-edged pale stripe extends from under the eye through the ear to the dorsal side of the upper arm insertion; this irregularly wavy stripe is palest (e.g., cream) under the eye but posteriorly represents an undarkened strip of ground color. The anterior lateral pale stripe tends to be more pronounced in males than in females (fig. 4). The dorsal ground color of limbs and tail is like the rest of the animal but with blackish cross-banding of variable distinctness. The largest male (USNM 322911) has a pale yellowish wash in the area just above and posterior to the insertion of the forelimbs.

The ventral surfaces range from sparsely to noticeably dotted with dark reddish brown or black. Ventral ground color was basically white in females (holotype and MBUCV-CWM 18309), but with the cloacal area being yellow in one (USNM 322912). A male (AMNH 136763) was pale gray beneath limbs and paler gray on chin and throat, turning orangish pink under the neck and over the venter; it had a suffusion of brighter orangish pink in the cloacal region and on the base of the tail.

The dewlap skin in one male (AMNH 136763) was a mottled bluish gray proximally and yellowish cream distally; in the other male (USNM 322911) the skin was pale bluish white, with a few small, darker greenish gray blotches proximally. Scales of the dewlap were bluish white (USNM 322911) or pale bluish gray, turning pink at the anterior and posterior ends of the longitudinal scale rows (AMNH 136763).

Females have smaller dewlaps that were very pale gray with a few small, vague black spots (holotype and MBUCV-CWM 18309),



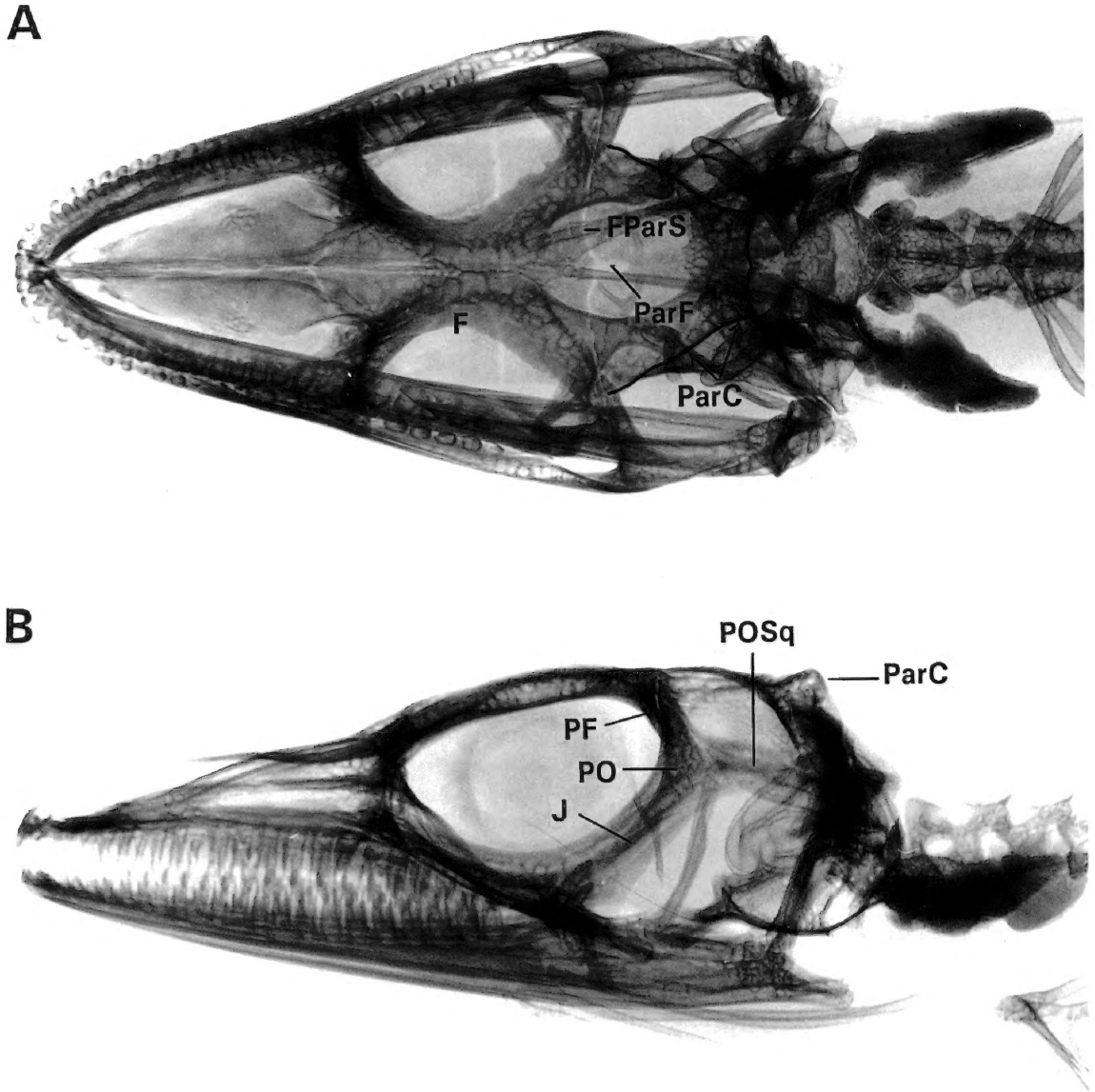


Fig. 5. Radiographs of skull of *Phenacosaurus neblininus*, new species (AMNH 129241♀, holotype). Abbreviations: F, frontal; FParS, frontoparietal suture; J, jugal; ParC, parietal crest (emphasized with ink in dorsal view); ParF, parietal foramen; PF, postfrontal; PO, postorbital; POSq, postorbital-squamosal arch.

or light and dark blue gray (USNM 322912), all with rows of pale cream or white scales.

The female holotype and one male (USNM 322911) both had a brown iris, a bright yellow tongue, and an unpigmented throat lining.

The preceding is a composite description of color and pattern based on transparencies

and on field-catalog notes by Myers, McDiarmid, and C. J. Cole, with reference to the preserved specimens. The vague dark pattern is retained in preservative, the specimens being gray or grayish brown, with dark dotted, dirty white ventral surfaces.

The peritoneum is black (based on USNM 322912, see below).

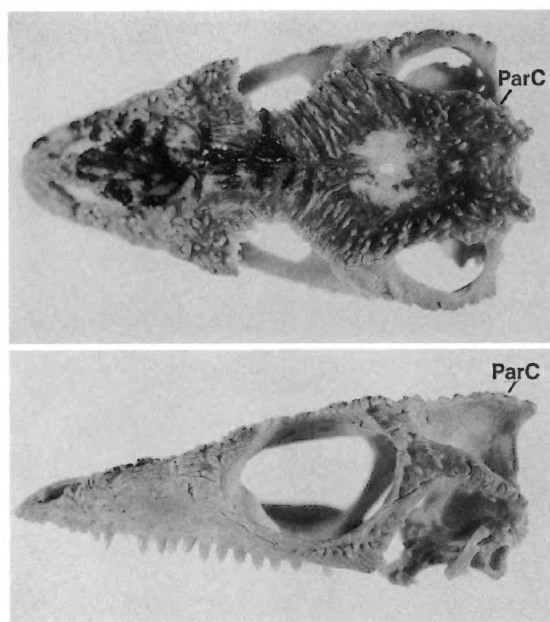


Fig. 6. Skull of *Phenacosaurus heterodermus* (Duméril), showing well developed parietal crest (AMNH 44987♀, 63 mm SVL).

#### OSTEOLOGY

Osteological data were obtained from X-ray photographs of four adults (AMNH 129241♀, 136763♂, MBUCV-CWM 18309♀, USNM 322911♂) and limited dissection of another one that had already been cut open in the field for tissue sampling (USNM 322912♀).

**SKULL:** Radiographs (fig. 5) indicate that the dorsal and postocular cephalic ridges reflect underlying bony crests as follows: The supraocular crests are the lateral edges of the frontal bone, the orbital margins of this bone being raised relative to the median part. The external circumparietal ridge represents flared dorsolateral and posterior free margins of the parietal (fig. 5A); the rear margin of the circumparietal crest is projected posterodorsally, as seen by radiography in lateral view (fig. 5B).

The parenthesis-shaped postocular crest results from lateral enlargement of the bony postorbital rim (jugal + postorbital + post-frontal), and the horizontal temporal crest reflects the underlying postorbital-squamosal arch (fig. 5B). A large calcified endolymphatic gland lies behind the skull on each side of the neck (fig. 5).

**VERTEBRAE AND RIBS:** Radiographs of four adults show 23 presacral vertebrae, including atlas and axis, followed by two sacral vertebrae with prominent pleurapophyses. Of eight cervical vertebrae, the last five (possibly the last four in one specimen) bear ribs, followed by five thoracic vertebrae with ribs (tied to sternal-xiphisternal ribs) and 6 or 7 post-thoracic vertebrae with ribs, the last of which are very short; there are 3–4 lumbar vertebrae. Postxiphisternal chevrons could not be counted accurately, but there seem to be 4–5, with the first several tied to the dorsal ribs and one or two posterior ones apparently floating free.

Dissection of USNM 322912 revealed three sternal ribs followed by two xiphisternal ribs. The suture between the sternal horns and xiphisternal rods was not detected, but the position of the last sternal rib (on presumed sternal horn) essentially matches figure 4C in Etheridge's dissertation (1959).

The first 10 caudal vertebrae have posterolaterally directed transverse processes that decrease in size posteriad. One male has the processes on caudal vertebra 10 reduced to laterally directed nubs and the female holotype has a lateral nub on one side of vertebra 11. Except for the last specimen, caudal vertebrae 11 et seq. lack transverse processes. Autotomy septa are lacking.

**ILIUM:** The ilium was examined in situ by partial dissection on the right side of USNM 322912. The ilial shaft is laterally compressed and its dorsal edge inclines smoothly into a blunt anterior iliac process very much like figure 6B in Lazell (1969: 20). The leading anterior edge of the ilium forms a nearly right angle ventrad from the tip of the iliac process, again much like Lazell's figure.

**REMARKS:** The circumparietal crest seems to correspond topographically with the parietal roofing crest of *Phenacosaurus heterodermus*, which, however, differs from *P. neblininus* in having the rear of the crest extending posteriorly beyond the supraoccipital (cf. figs. 5, 6). *P. heterodermus* also has the posterior crest margin noticeably concave and lowered in the middle (showing as a median "notch" on intact specimens, in which the external crest does not precisely track the cupped margin of the bone); *P. neblininus* lacks the posterior concavity and has no ex-

ternal indication (notching) of any lowering in the middle.

The flared crests of these species seem simply to be an extension and elaboration of the low, externally undetectable U-, Y-, or V-shaped parietal crest or ridge system of other anoles (Etheridge, 1959: 6–7, 80–81; Myers, 1971: fig. 8). A pronounced, laterally flared parietal crest occurs also in *Anolis equestris* (e.g., AMNH 72634, 73848), but in that species the lateral edges converge posteriorly to a point (V-shaped), quite unlike the broad posterior edge shown here for *Phenacosaurus neblininus* and *P. heterodermus* (figs. 5, 6). The top of the skull especially is very rugose in *P. heterodermus* (fig. 6) and the radiographs also suggest considerable rugosity in *P. neblininus* (fig. 5).

The shape of the iliac process shown by *neblininus* was claimed by Lazell (1969) to be diagnostic for *Phenacosaurus*. Other postcranial skeletal features considered characteristic of this genus date mainly from Etheridge (1959). Of these, lack of caudal autotomy is consistent with Etheridge's data for *Phenacosaurus* and South American alpha *Anolis*, but number of presacral vertebrae, number of sternal vs. xiphisternal ribs, and number of lumbar vertebrae and post-sacral (i.e., postxiphisternal) chevrons agree with *Anolis* but not with *Phenacosaurus* as previously defined.

Some of the purported osteological synapomorphies of *Phenacosaurus* may define only the *heterodermus* species group. The *orcesi* group, to which *P. neblininus* is assigned, is less well known.

#### PHENACOSAUR HEMIPENES

The small hemipenes of the two adult male paratypes of *Phenacosaurus neblininus* (AMNH 136763, USNM 322911) were only partially everted during field preservation. Subsequent attempts to evert the left organs after removing and softening them (in trisodium phosphate followed by glycerin) resulted in little improvement. However, similar treatment of a better everted hemipenis resulted in a completely expanded organ of another species, *P. nicefori* Dunn (KU 181131). It and the best everted organ of *P.*

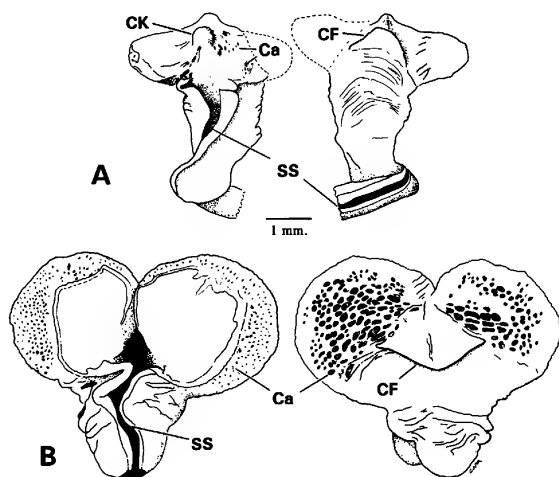


Fig. 7. *Phenacosaurus* hemipenes in sulcate (left) and asulcate (right) view; drawn to same scale. **A.** *Phenacosaurus neblininus*, new species. Incompletely everted left organ of a paratype (AMNH 136763, 56 mm SVL). **B.** *Phenacosaurus nicefori* Dunn. Completely everted left organ of KU 181131 (49 mm SVL). Abbreviations: Ca, calyces; CF, asulcate-side crotch flap; CK, sulcate-side crotch knob; SS, sulcus spermaticus.

*neblininus* are illustrated (fig. 7) and some comparisons can be made.

The hemipenes of both species are bilobed and both have a triangular crotch flap on the asulcate side of the organ. Although the specimen of *P. nicefori* is 7 mm shorter (49 mm SVL) than the one of *P. neblininus* (56 mm SVL), its hemipenis seems much larger. It is not possible to be confident about a gross difference in size, inasmuch as the lobes have barely started to evert on the *neblininus* organ, but at least the asulcate crotch flap is clearly larger in *nicefori*. (The crotch flap is tilted distad in the *neblininus* drawing but is pointed more proximally in *nicefori*.)

The basal, undivided part of the hemipenis is relatively longer in *P. neblininus*, in which the stalk is basally twisted (possibly but not certainly an artifact of preservation). The sulcus spermaticus widens at the crotch and, at least in *nicefori* expands to form (or is confluent with) a broad, circular nude space on the sulcate side of each lobe. The lobes are otherwise calyculate in *nicefori*, with the calyces grading from small on the sulcate side to much larger on the asulcate side. Small calyces are discernible on the sulcate sides of

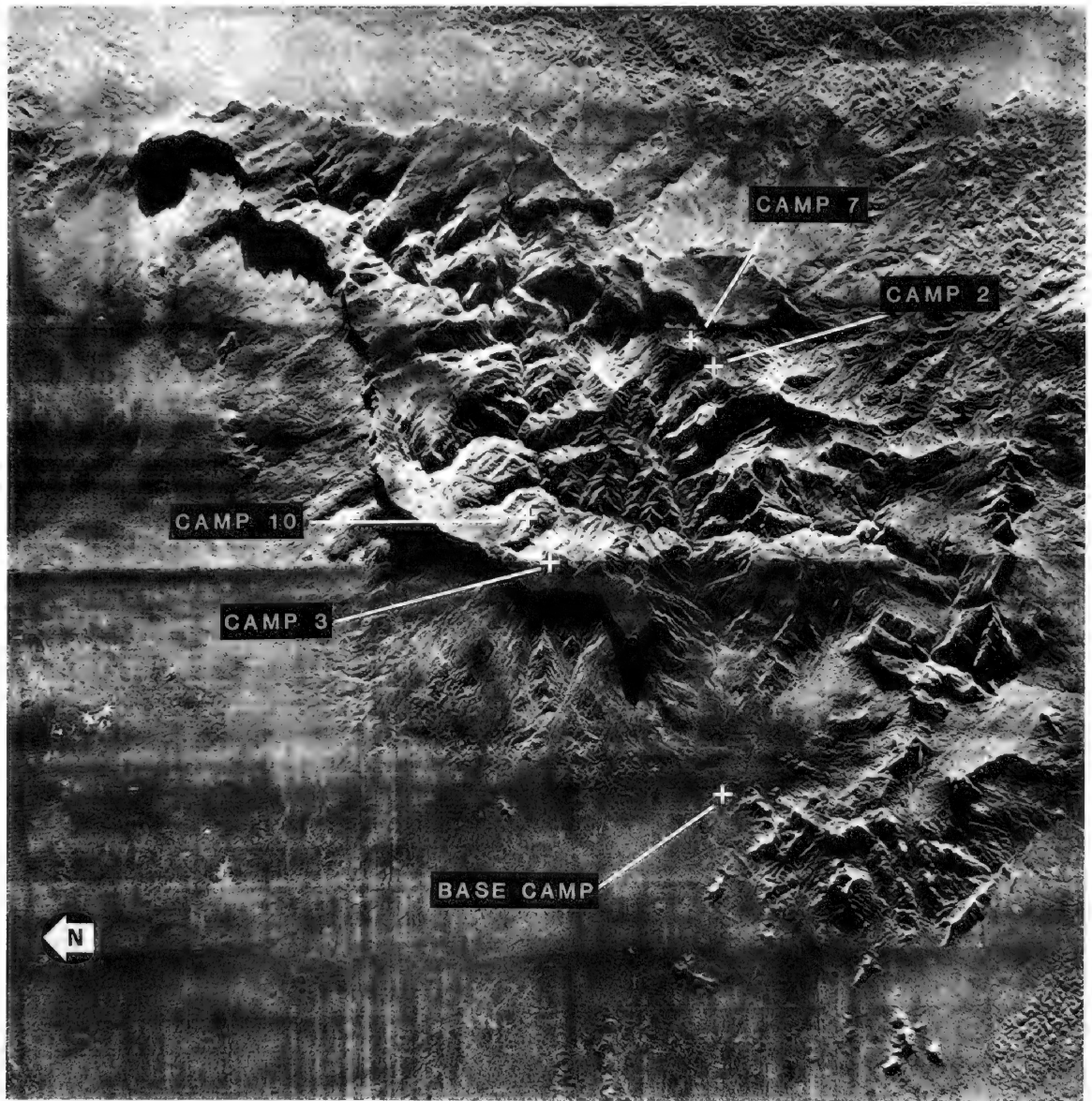


Fig. 8. Side-looking radar image of the Cerro de la Neblina massif, showing lowland Base Camp and the four collecting stations (numbered upland camps) for *Phenacosaurus neblininus*.

the unexpanded hemipenial lobes in *P. neblininus*, in which the fully everted lobes presumably are extensively calyculate.

A rounded, stiff knob of tissue (CK in fig. 7A) appears to rise from the loose, unexpanded tissue in the crotch of the *P. neblininus* hemipenis. It seems likely to be an artifact of partial eversion, but this is by no means certain.

#### HABITAT

During the course of the Cerro de la Neblina Expedition, camps were established and collections made by scientists at 12 different locations between 770 and 2400 m elevation on the massif. Sites were selected for several reasons but primarily because of the access each provided to different areas and habitats.



Fig. 9. Habitat (low vegetation in foreground) of *Phenacosaurus neblininus* at the type locality. View to NNE from helipad at Camp 7—1850 m elevation on side of a hanging valley (lower end in mid-picture) on southern versant of the Cañon Grande del Cerro de la Neblina. [C. W. Myers; November 30, 1987]

Specimens of *Phenacosaurus neblininus* were collected at four of these camps (fig. 8).

**CAMP 2:** Three different camps were established in a small valley situated 2.5–3.5 km NE of Pico Phelps and about 20.5 km E of Base Camp. The valley drains northeast towards Cañon Grande and is bordered to the southwest by Pico Maguire (2425 m) and to the east by a steep escarpment below which was situated Camp 7. The camps were on the west side of the valley between 2085 and 2100 m and separated by about 1 km. Collections were made in the western part of the valley between a small stream that flows north into Cañon Menor and eventually into Cañon Grande, and the flanks of Pico Maguire. The vegetation in open areas was typical of inundated savannas on Neblina and included pitcher plants of the genus *Heliamphora*, many species of Xiridaceae, terrestrial orchids, and bromeliads. Small shrubs (Ericaceae) and dense patches of the bromeliad *Brocchinia tatei* also were abundant. The small stream was bordered by a short gallery forest that included the palm *Euterpe*, other trees, and dense stands of bamboo, while the slopes of Pico Maguire were rocky with scattered stands of forest dominated by *Bonnetia*.

The large male *Phenacosaurus* was collected near Camp 2 from the leaf of a *Brocchinia tatei* in the afternoon. The juvenile specimen was found in the evening asleep on the stem of a small shrub near a light trap.

**CAMP 3:** This camp was situated at 1820 m on the northeastern side of the vast Northwestern Plateau about 13.7 km NE of Base Camp (fig. 8). Drainage was southern into Cañon Grande. This extensive plateau was covered by a relatively uniform, inundated savanna made up of characteristic plants including species of *Heliamphora*, *Stegolepis*, and *Brocchinia* (fig. 1); the surrounding rocky ridges were dominated by *Neblinaria celiæ*. The single male *Phenacosaurus* from this site was found at night on a *Neblinaria* leaf.

**CAMP 7:** This camp (the type locality) was on the west side of a hanging valley situated on the south slope of Cañon Menor, about 5.1 km NE of Pico Phelps and about 21.5 km E of Base Camp. A helicopter landing area and the original campsite was on a rocky knoll at about 1850 m in an extensive patch of large *Brocchinia tatei* that had been cleared for that purpose (fig. 9). West of this site a steep slope ascended to a peak at about 2200 m. From this peak, one could see the valley

in which Camp 2 had been situated and the flanks of Pico Maguire. About 80 m below the landing area, a second permanent camp was established in forest along a small stream. The coffee-colored "black" water (heavily stained with tannin and other plant products) flowed northward over a gravel and boulder bed, eventually reaching Cañon Menor and the Río Baría. A low canopy (15 m) dense cloud forest bordered the stream and lower reaches of the adjacent slopes. Arboreal bromeliads were abundant in the trees and a thick "moss layer" covered the trunks. Above the forest the slopes were rocky with dense patches of bromeliads (*Brocchinia*), scattered dwarf trees (*Tyleria* and *Bonnetia*), and a few small palms (*Euterpe*).

The two *Phenacosaurus* specimens from Camp 7, both females, were found in open areas above the forest. The holotype was sleeping 1.5 m aboveground in a small tree, intertwined among leaves at the end of a twig. The other had climbed onto an insect light trap, conceivably after having been disturbed in sleep.

**CAMP 10:** This camp was NE of Camp 3, at a slightly lower elevation, 1690 m. The site was in a small valley adjacent to an extensively burned *Heliamphora-Neblinaria* savanna about 12.5 km NNW of Pico Phelps and 16.5 km NE of Base Camp. A stream bordered by dense vegetation with *Euterpe* palms flowed south from the valley and cascaded over a rocky escarpment and eventually into Cañon Grande. A list of some savanna plants and photographs of the area can be found in Givnish et al., 1986. The single female lizard from this site was found asleep on a thin leaf of a bromeliad growing in a cluster of *Neblinaria* at about 2000 hr.

**SUMMARY:** From these limited observations it appears that *Phenacosaurus neblininus* is restricted to relatively open (nonforested) habitats on Cerro de la Neblina at about 1700–2200 m elevation. Individuals apparently are active during the day and have been seen on the leaves of the bromeliad, *Brocchinia tatei*. At night they have been found 0.5–1.5 m aboveground asleep on the ends of twigs and leaves of shrubs, small trees, and other plants. Although seemingly uncommon and in spite of the unusual habitats in which

it occurs, *Phenacosaurus neblininus* is behaviorally and ecologically similar to many other species of anoline lizards with which we are familiar.

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The type series of the new species is equally divided among the collections of the American Museum of Natural History, New York (AMNH), the Museo Biología of the Instituto de Zoología Tropical, Universidad Central de Venezuela, Caracas (MBUCV), and the National Museum of Natural History, Washington, D.C. (USNM). Specimens to be cataloged at MBUCV are parenthetically identified by CWM (Myers) and RWM (McDiarmid) field-catalog numbers.

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